

**AMENDMENTS TO THE CLAIMS**

1. **(Currently Amended)** A reconstituted cell-free translation system for generating a peptidomimetic product comprising:
  - (a) translation factors; and
  - (b) more than one elongator tRNA species which (i) is charged with a non-naturally occurring amino acid or amino acid analog, and (ii) recognizes a trinucleotide sense codon,wherein the cell-free translation system translates exogenously added mRNA species with highly selective incorporation at each of said trinucleotide sense codons to form the peptidomimetic product, ~~and~~  
wherein the peptidomimetic product comprises said non-naturally occurring amino acids or amino acid analogs, and  
wherein the system lacks the ability to synthesize at least one wild-type amino acyl tRNA species.
2. **(Previously Presented)** The translation system of claim 1 for generating a peptidomimetic product, which system is substantially free of the translation factors EF-P, W, W2 and rescue.
3. **(Canceled)**
4. **(Previously Presented)** The translation system of claim 1 for generating a peptidomimetic product, which system is substantially free of a translation factor selected from the group consisting of EF-P, W, W2 and rescue.
5. **(Previously Presented)** The translation system of claim 1, wherein the amino acid analog is selected from the group consisting of  $\beta$ -cyanoalanine, canavanine, djenkolic acid, norleucine, 3-phosphoserine, homoserine, dihydroxyphenylalanine, 5-hydroxytryptophan, 1-methylhistidine, 3-methylhistidine, allyl glycine (or its alkyne counterpart), O-methyl-serine, biotinyl-lysine, biotinyl-cysteine (or other biotin-labelled amino acids) cyclohexylalanine, homoglutamate, D-alanine (or other D-amino

acids), N-methyl glycine (or other N-methyl amino acids) and epsilon-N-methyl-lysine.

6. **(Previously Presented)** The translation system of claim 1, further comprising more than one exogenously added mRNA species encoding different peptidomimetic products.
7. **(Currently Amended)** A cell-free translation system comprising translation factors and tRNA species that translates exogenously added mRNA species to form a peptidomimetic product, which system
  - (a) lacks more than one active wild-type elongator amino acyl tRNA species and lacks the ability to synthesize said wild-type amino acyl tRNA species, and
  - (b) comprises more than one exogenous elongator amino acyl tRNA species charged with a nonnatural amino acid species or amino acid analog, the exogenous elongator amino acyl tRNA species replacing said wild-type elongator amino acyl tRNA species.
8. **(Currently Amended)** A cell-free translation system comprising translation factors and tRNA species that translates ~~exogeneously~~ exogenously added mRNAs to form a peptidomimetic product, which system
  - (a) lacks one or more active wild-type amino acyl tRNA species and lacks the ability to synthesize said wild-type amino acyl tRNA species,
  - (b) includes at least one exogenous amino acyl tRNA species charged with a nonnatural amino acid species or amino acid analog, the exogenous amino acyl tRNA species replacing said active wild-type amino acyl tRNA species, and
  - (c) comprises a plurality of different mRNA species encoding a plurality of peptidomimetic products.
9. **(Currently Amended)** A kit for translating ~~exogeneously~~ exogenously added mRNA to form a peptidomimetic product, the kit comprising:
  - (a) translation factors and more than one elongator tRNA species charged with a non-naturally occurring amino acid or amino acid analog capable of translating exogenously added mRNA species with highly selective incorporation at each

- codon to form a peptidomimetic product; and
- (b) instructions associated there with for using the kit for translating ~~exogeneously~~ exogenously added mRNA to form a peptidomimetic product.
10. **(Currently Amended)** A kit for translating ~~exogeneously~~ exogenously added mRNA to form a peptidomimetic product, the kit comprising:
- (a) a cell-free translation system comprising translation factors and tRNA species capable of translating exogenously added mRNA species to form a peptidomimetic product, which system
- (i) lacks more than one active wild-type elongator amino acyl tRNA species and lacks the ability to synthesize said wild-type amino acyl tRNA species,
- (ii) includes more than one exogenous elongator amino acyl tRNA species charged with a nonnatural amino acid species or amino acid analog, the exogenous elongator amino acid acyl tRNA species replacing said wild-type elongator amino acyl tRNA species; and
- (b) comprises instructions associated therewith for using the kit for translating ~~exogeneously~~ exogenously added mRNA to form a peptidomimetic product.
11. **(Previously Presented)** A method for generating a peptidomimetic product comprising:
- (a) contacting the translation system of claim 1 with one or more exogenous mRNA species encoding peptidomimetic products; and
- (b) allowing sufficient time for the exogenous mRNA species to be translated, thereby generating the peptidomimetic product.
12. **(Canceled)**
13. **(Previously Presented)** The method of claim 11, wherein the method is carried out on a library of at least 100 different mRNA species.
14. **(Previously Presented)** The method of claim 11, wherein the mRNA species are generated by in vitro transcription in the translation system.

15. **(Previously Presented)** The method of claim 11, wherein the peptidomimetic products are formed as a covalent adduct of the exogenous mRNA by which said products are encoded.
16. **(Currently Amended)** The method of claim 11, wherein the translation system is contacted with a library of different ~~exogeneously~~ exogenously mRNA species to generate a variegated population of peptidomimetics products of at least  $10^3$  different sequences.
17. **(Original)** The method of claim 16, wherein at least  $10^8$  different sequences are produced.
18. **(Canceled)**
19. **(Previously Presented)** A method for generating a peptidomimetic comprising:  
    (a) contacting the translation system of claim 7 with one or more exogenous mRNA species encoding peptidomimetic products; and  
    (b) allowing sufficient time for the exogenous mRNA species to be translated, thereby generating the peptidomimetic product.
- 20-22. **(Canceled)**
23. **(Previously Presented)** The translation system of claim 1, wherein the translation factors are bacterial translation factors.
24. **(Previously Presented)** The translation system of claim 7, wherein the translation factors are bacterial translation factors.
25. **(Previously Presented)** The translation system of claim 1, comprising four or more tRNA species charged with a non-naturally occurring amino acid or amino acid analog.

26. **(Previously Presented)** The translation system of claim 6, comprising four or more tRNA species charged with a non-naturally occurring amino acid or amino acid analog.
27. **(Previously Presented)** The translation system of claim 1, wherein highly selective incorporation at each codon comprises at least 90% selective incorporation.
28. **(Previously Presented)** The translation system of claim 1, wherein highly selective incorporation at each codon comprises at least 95% selective incorporation.
29. **(Previously Presented)** The translation system of claim 1, wherein highly selective incorporation at each codon comprises at least 98% selective incorporation.
30. **(Previously Presented)** The method of claim 13, wherein the peptidomimetic products are identified or isolated from the translation system based on catalytic or binding activity.
31. **(Previously Presented)** The translation system of claim 7 comprising a plurality of different mRNA species.
32. **(Previously Presented)** The translation system of claim 1, wherein the peptidomimetic product comprises more than two unnatural amino acids or amino acid analogs.
33. **(Previously Presented)** The translation system of claim 31, wherein the peptidomimetic product comprises five unnatural amino acids or amino acid analogs.
34. **(Currently Amended)** The translation system of claim 7, wherein ~~the one or more of each codon~~ said exogenous elongator amino acyl tRNA species is specific for one of the 61 sense codons.

35. **(Currently Amended)** The translation system of claim 7, wherein said exogenous elongator amino acyl tRNA species ~~one or more of each codon~~ is specific for one of the three termination codons.
36. **(Previously Presented)** The method of claim 11, comprising contacting the translation system with more than one exogenous mRNA species.
37. **(Previously Presented)** The method of claim 19, comprising contacting the translation system with more than one exogenous mRNA species.
38. **(Previously Presented)** The method of claim 11, wherein the peptidomimetic products are identified, isolated, or both.
39. **(Previously Presented)** The method of claim 19, wherein the peptidomimetic products are identified, isolated, or both.
40. **(Previously Presented)** The translation system of claim 1, wherein the amino acyl tRNA species is synthesized from a tRNA species lacking a terminal CA dinucleotide.
41. **(Previously Presented)** The translation system of claim 1, wherein the amino acyl tRNA species is synthesized from a tRNA species that is synthesized *in vitro*.
42. **(Previously Presented)** The translation system of claim 1, wherein the peptidomimetic product comprises an unnatural backbone.
43. **(Canceled).**
44. **(Previously Presented)** The translation system of claim 1, wherein the non-naturally occurring amino acid or the amino acid analog is synthesized by chemical modification of a natural amino acyl tRNA.

45-51. (Canceled)

52. **(Previously Presented)** The method of claim 19, wherein the exogenous mRNA species is generated by *in vitro* transcription in the translation system.
53. **(Previously Presented)** The cell-free translation system of claim 7, wherein the translation system translates exogenously added mRNA species with highly selective incorporation at each codon to form a peptidomimetic product.
54. **(Previously Presented)** The kit of claim 9, wherein the kit translates exogenously added mRNA species with highly selective incorporation at each codon to form a peptidomimetic product.
55. **(Previously Presented)** The kit of claim 10, wherein the cell-free translation system translates exogenously added mRNA species to form a peptidomimetic product.